Generic Fuel Object/Rack Scanning Fissile Material Detection System

Technical description: The INEEL developed Generic Fuel Object/Rack Scanner is a water-tight gamma spectrometery system capable of performing mobile non-destructive assay and characterization of fissile material in underwater environments. The ORTEC detection portion of the system is constructed of a primary Sodium Iodide detector, Cadmium Zinc Telluride backup detector, photomultiplier tube, and a ORTEC power amplifier. Focusing and filtering of the detector is accomplished by a round 3" Bismuth collimator and a Tungsten shield which allows the system to detect less than 1/2 gram of fissile material in either a high (10 R/hr) or low (5 mr/hr) background levels. System integration and control of the ORTEC multichannel data acquisition unit, Krautkramier digital analyzer, and laptop computer is performed by Labview 5.0 software package. Precise material location is achieved thru the combination of a laser to detect horizontal and vertical planes, and an ultrasonic transducer for depth detection.

Old description: A single Ortec scintillation type detector with a Canberra amplifier contained in a water-tight cylinder was used to enter the narrow 6" round 901 fuel storage racks to determine the presence and location of fissile material. The [NaI(TI) and CdZnTe ??]detector incorporates a round 3" Bismuth collimator and shielding to accurately identify generic fuel objects inside the storage tubes. The use of a precise x,y,z positioning system allows operaters to determine the exact location of the fuel within the water basin. The characterization system is sensitive enough to detect ½ gram of irradiated fissile material (fuel pellets). The detector is calibrated to detect Cs137, which is a fission product and indicates the presence of uranium fuel. The analytic analysis of the Cs137/U235 ratio then determines the amount and concentration of fuel present in the identified object.